

Background Challenges

BIC

04/13/2026, Maria Zurek

Tasks

How to proceed in addressing the background challenges

Answering to 3 families of questions:

- a) Impact on detector performance;
- b) Impact on data flow, requested bandwidth and potential dead-time;
- c) radiation/fluence damages.

} Using data from simulation campaigns

} Using radiation maps with DIS + background

a) Impact on detector performance

DSC responsibility

- **Progressing in two steps**

1. **Make use of what is at hand**, namely the Feb. 2026 simulation campaign (10 x 100) and related simulation background (probably optimistic concerning beam-gas rates as vacuum after 10000 A-h of running is assumed)
 - Events with background (10 μ m gold coating on the beampipe):
/volatile/eic/EPIC/RECO/26.02.0/epic_craterlake/Bkg_Exact1S_2us/GoldCt/10um/DIS/NC/10x100/minQ2=1/
 - Events without background:
/volatile/eic/EPIC/RECO/26.02.0/epic_craterlake/DIS/NC/10x100/minQ2=1/
 - **Obtain subsystem performance(*)** from DIS + the background
 - **Compare the performance** with / without background
2. **Challenge the subsystems with increased background rates**
 - Premature to give now a recipe for the increased background; the outcome of the first step will provide suggestions

a and b) Rates and performance

BIC uses this exercise to onboard a new postdoc T. Tsang.

First look into occupancies and rates within BIC (SciFi and AstroPix)

In Progress (not ready to show yet)

ECals

E-resolution (CD: vs p)

efficiency (CD: vs η , p)

π/e separation (CD only: vs p)

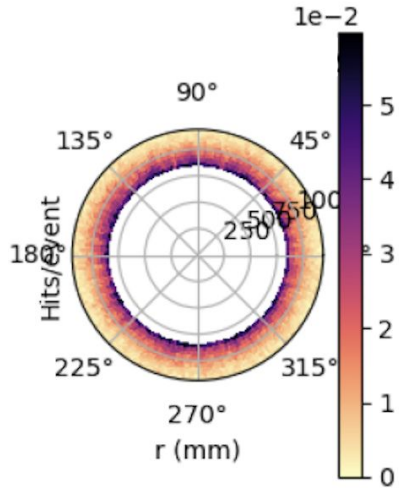
angular resolution (CD only)

- Using subsample of scattered electrons
- Wide range energy photons (low energy performance needed)
- Not enough statistics in the sample, might look into E/p as a first step
- AstroPix based

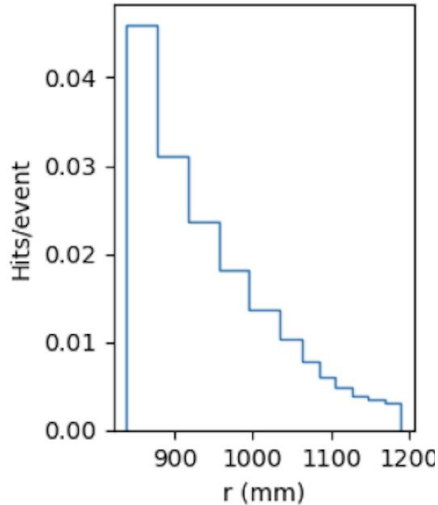
SciFi occupancies and rates

Hit = energy deposit above threshold (5 MeV) originating from a unique primary particle, electron going side presented below

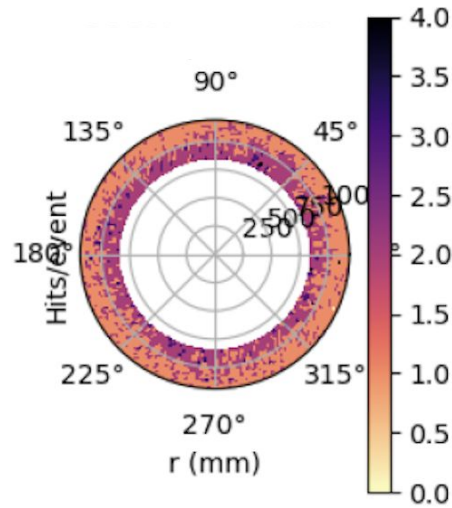
Average nb hits/event
per channel



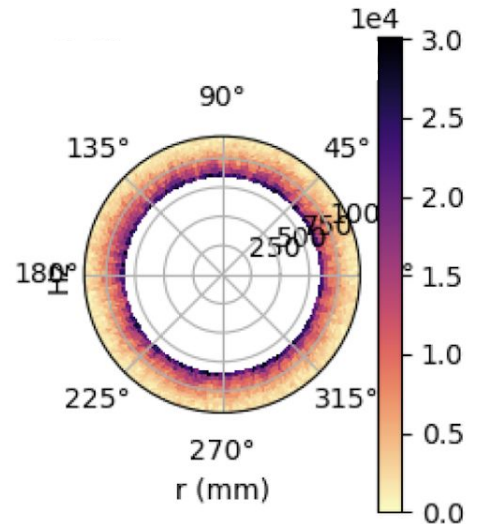
Average nb hits/event
per channel



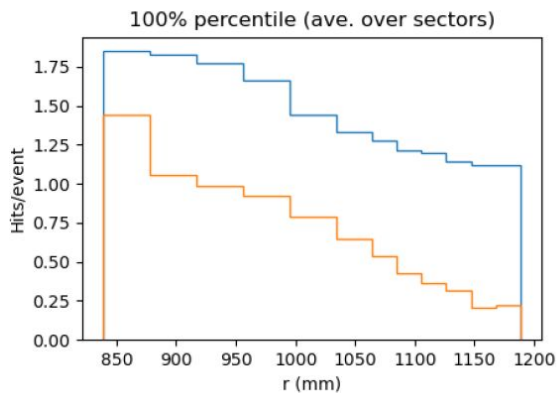
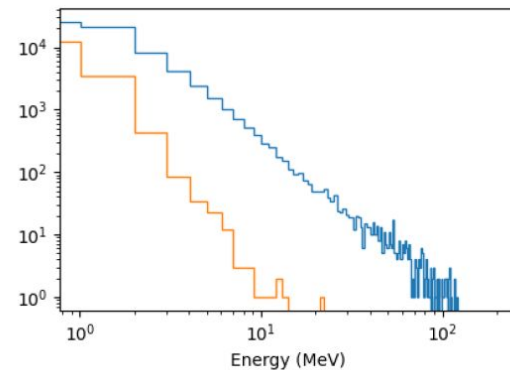
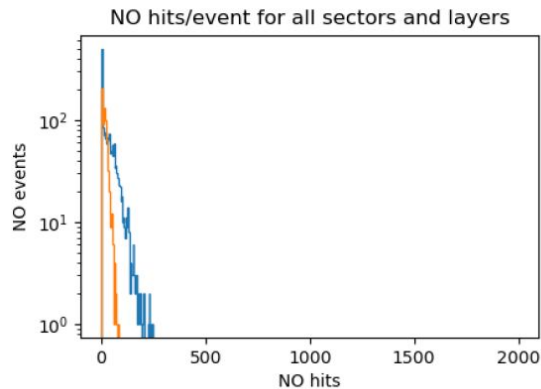
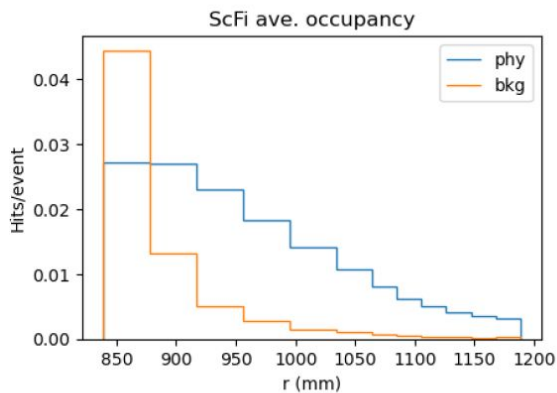
Max nb hits/event
per channel



Rate
per channel



SciFi occupancies



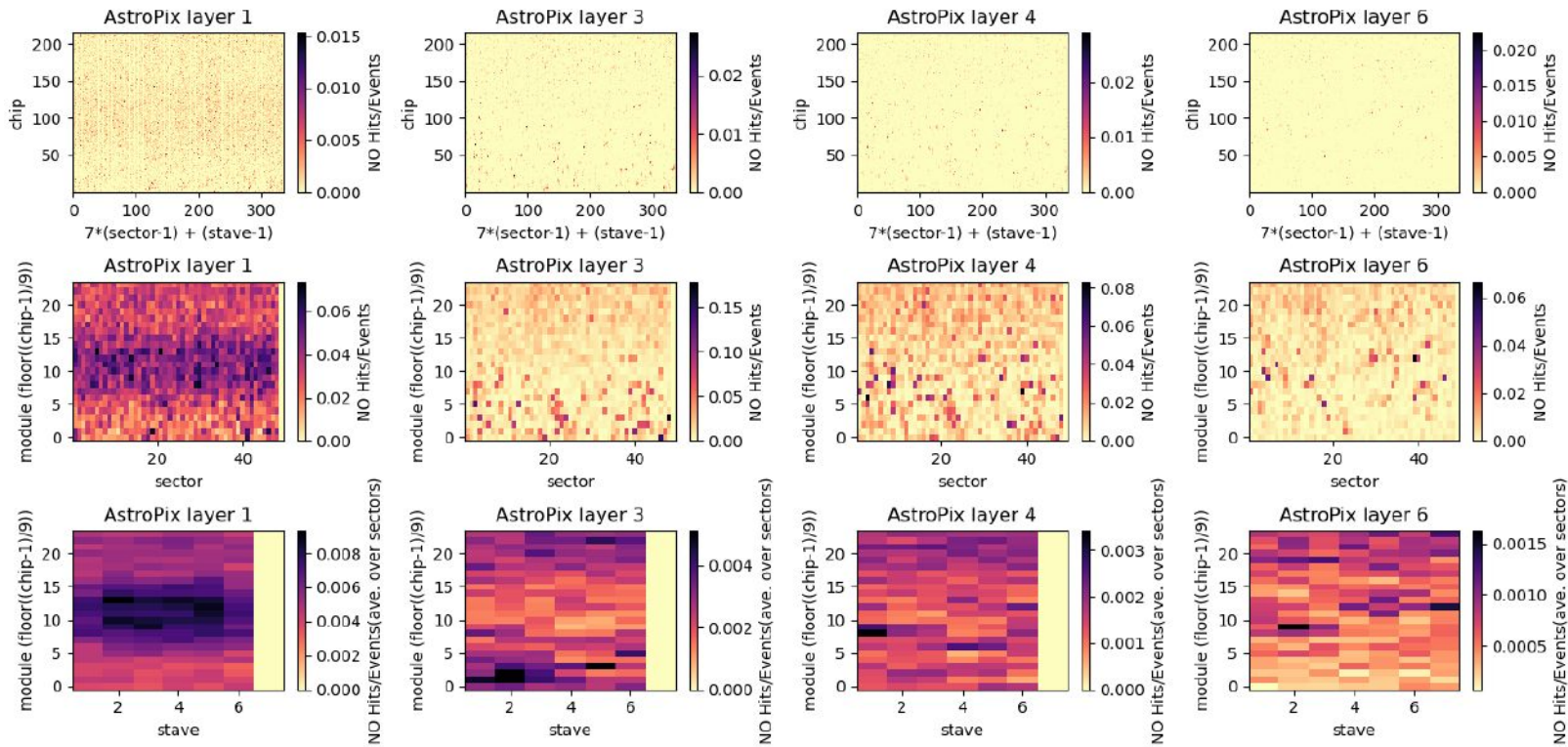
Hit = energy deposit above threshold (5 MeV) originating from a unique primary particle, electron going side presented

Mean: 41 hits/events

Max: 257 hits/events

Total rate: ~20 MHz

AstroPix Occupancies



c) Radiation/Fluence Damage

New Radiation Doses Files Evaluated - Similar doses to used in the reports below

Wiki page: https://wiki.bnl.gov/EPIC/index.php?title=Radiation_Doses

BIC SiPM performance under irradiation and expected rates:

- <https://indico.bnl.gov/event/28900/contributions/110045/attachments/63299/108667/2025-06-4-BIC-SiPMs.pdf>
- <https://indico.bnl.gov/event/29267/contributions/111742/attachments/63968/109892/2025-08-13-BIC-SiPMs.pdf>

